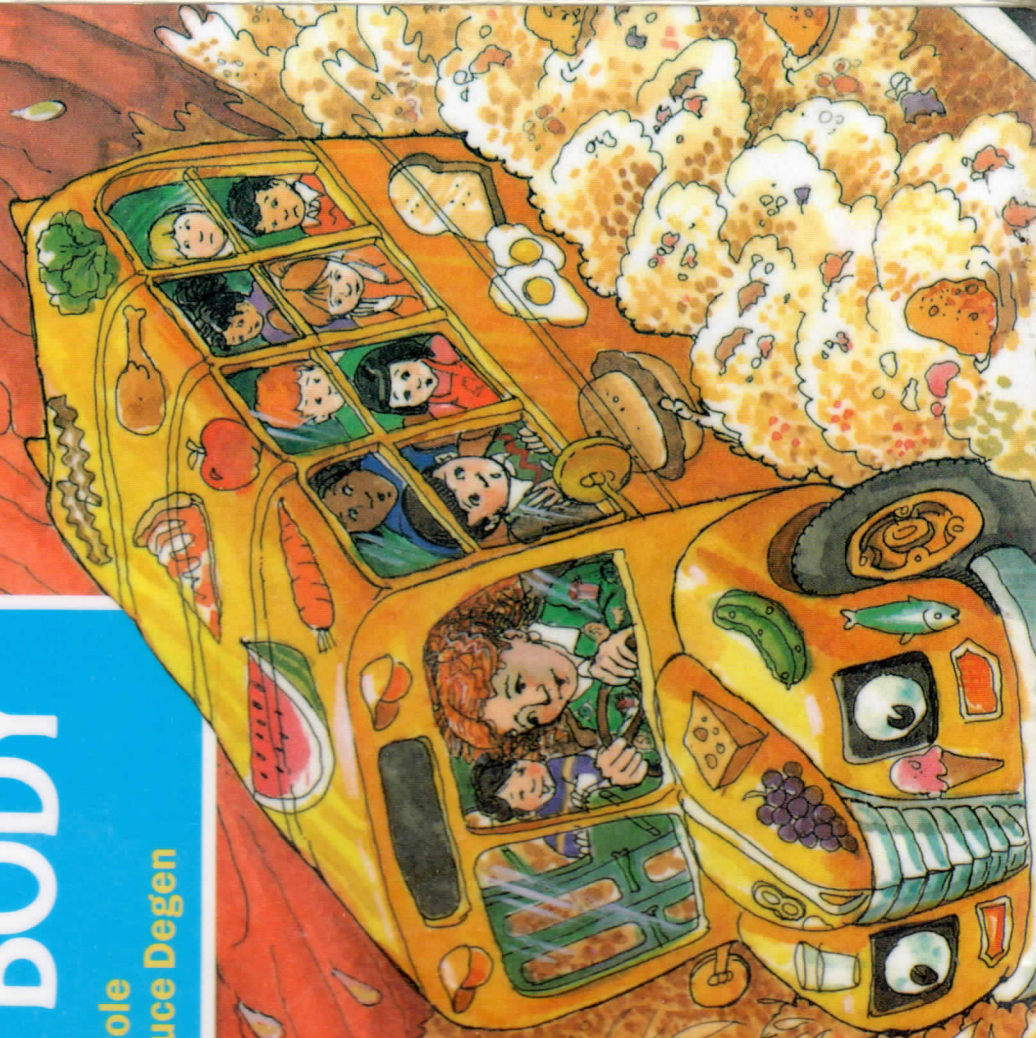


# THE MAGIC BUS INSIDE THE HUMAN BODY

Joanna Cole  
Illustrated by Bruce Degen

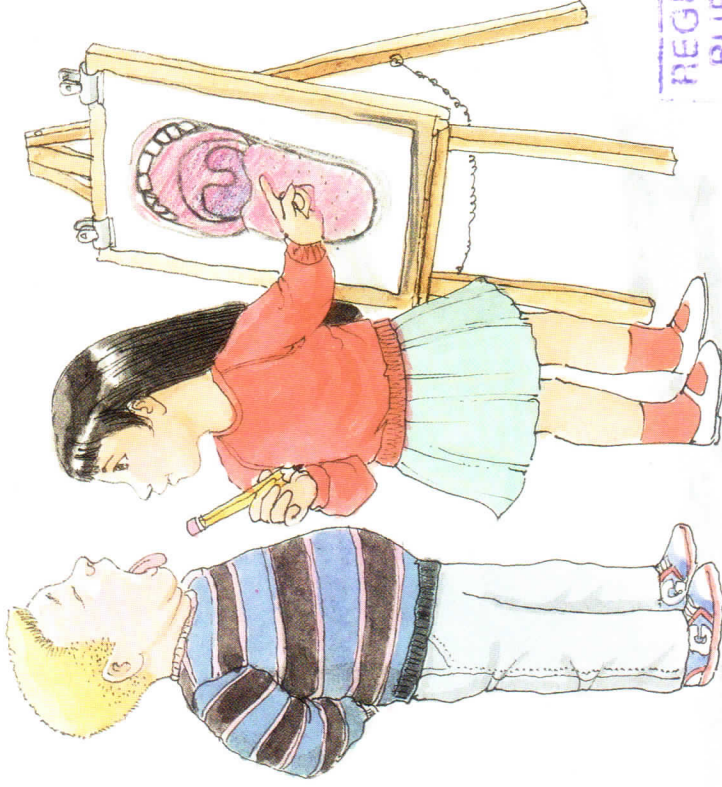




# THE MAGIC BUS INSIDE THE HUMAN BODY

By Joanna Cole

Illustrated by Bruce Degen



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Kingfisher Books



WE'RE GOING TO  
LEARN ABOUT  
OURSELVES.  
THIS SHOULD  
INTEREST YOU,  
ARNOLD!

It all began when Ms Frizzle  
showed our class a filmstrip  
about the human body.  
We knew trouble was about to start,  
because we knew Ms Frizzle  
was the strangest teacher in the school.

MY FAVOURITE  
HERBIVORE



MY FAVOURITE  
CARNIVORE



I CAN'T TAKE  
THE PRESSURE!



MY FAVOURITE  
OMNIVORE





A FILMSTRIP  
IS ONLY THE  
BEGINNING,  
YOU KNOW.

SHE PROBABLY  
HAS BOOKS  
ABOUT THIS,  
TOO!

# YOUR WONDERFUL BODY

WHEN'S  
BREAK?





# YOUR BODY IS MADE OF CELLS by Rachel

Your body seems  
to be all one piece,  
but actually it is  
made of trillions  
of tiny pieces,  
called cells.

MY BODY IS  
MADE OF  
TRILLIONS  
OF CELLS.

So is mine!



The very next day, The Friz made us  
do an experiment on our own bodies.

## SEE YOUR OWN CELLS

Most cells are so small that we can't see  
them without a microscope.

① Gently scrape  
inside of cheek  
with toothpick

② Stir end of  
toothpick in  
drop of water  
on a slide.

③ Add a drop of  
Iodine Solution  
to Colour Cells.

④ Look at slide  
under microscope.  
See Your cells.





Then she announced that we were going on a class trip to the science museum. We were going to see an exhibit about how our bodies get energy from the food we eat.

YOUR CELLS NEED ENERGY  
TO HELP YOU GROW, MOVE,  
TALK, THINK, AND PLAY.

JUST BEING IN  
MS FRIZZLE'S CLASS  
TAKES ALL MY  
ENERGY.



DIFFERENT KINDS OF CELLS  
HAVE DIFFERENT JOBS  
by Gregory



Lung cells  
help you  
breathe.



Muscle cells  
help you move.



Brain Cells  
help you think.

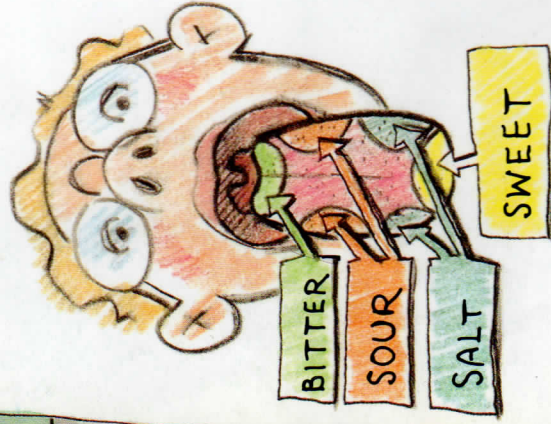




# YOUR TONGUE IS COVERED WITH THOUSANDS OF TASTE BUDS

by Arnold

Different parts of the tongue have taste buds that detect different flavours.



The trip started out like any other trip. We rode to the museum in the old school bus. Along the way, we stopped at a park for lunch.

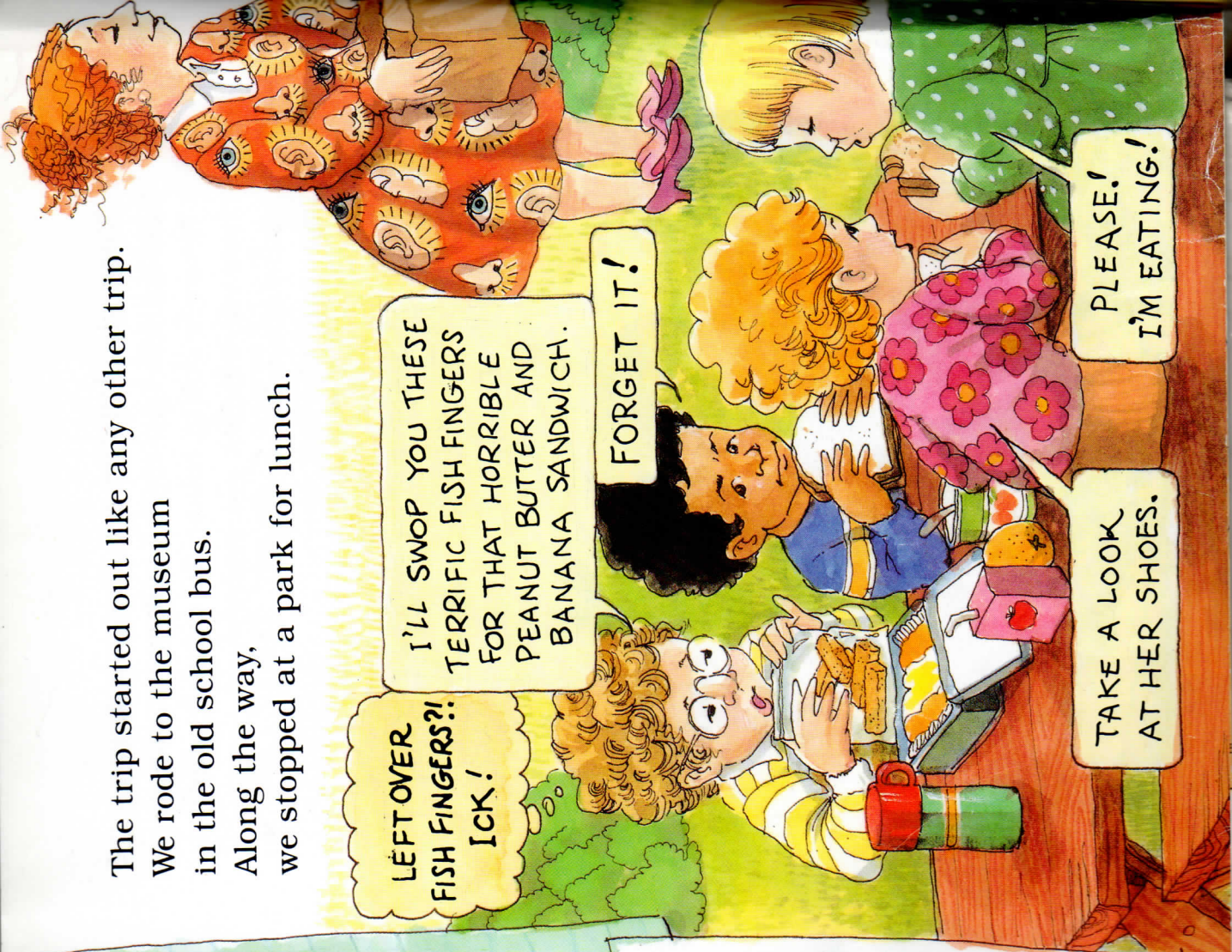
LEFT OVER FISH FINGERS?!  
ICK!

I'LL SWOP YOU THESE TERRIFIC FISH FINGERS FOR THAT HORRIBLE PEANUT BUTTER AND BANANA SANDWICH.

FORGET IT!

TAKE A LOOK AT HER SHOES.

PLEASE!  
I'M EATING!





When it was time to go,  
everyone got back on the bus—  
everyone but Arnold.  
He was still at the picnic table,  
daydreaming and eating  
a bag of Cheesie-Weesies.

WHEN YOU EAT, YOUR BODY DIGESTS  
THE FOOD SO YOUR CELLS CAN USE IT  
TO MAKE ENERGY.

## YOUR BODY NEEDS GOOD FOOD

by Carmen

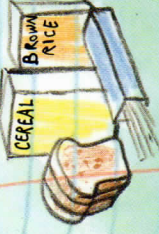
For high energy and  
good growing power  
eat lots of:



Fresh fruits  
and Vegetables



Milk and  
milk products



Whole grain  
cereal and Pasta



Lean Meats, Fish,  
Poultry, and eggs

AND NOT TOO MUCH JUNK FOOD

## A SCIENCE WORD

by Dorothy Ann

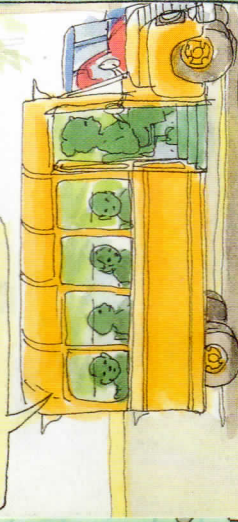
Digestion comes from  
a word that means  
to divide. When food  
is digested it is divided  
into smaller and smaller  
parts.



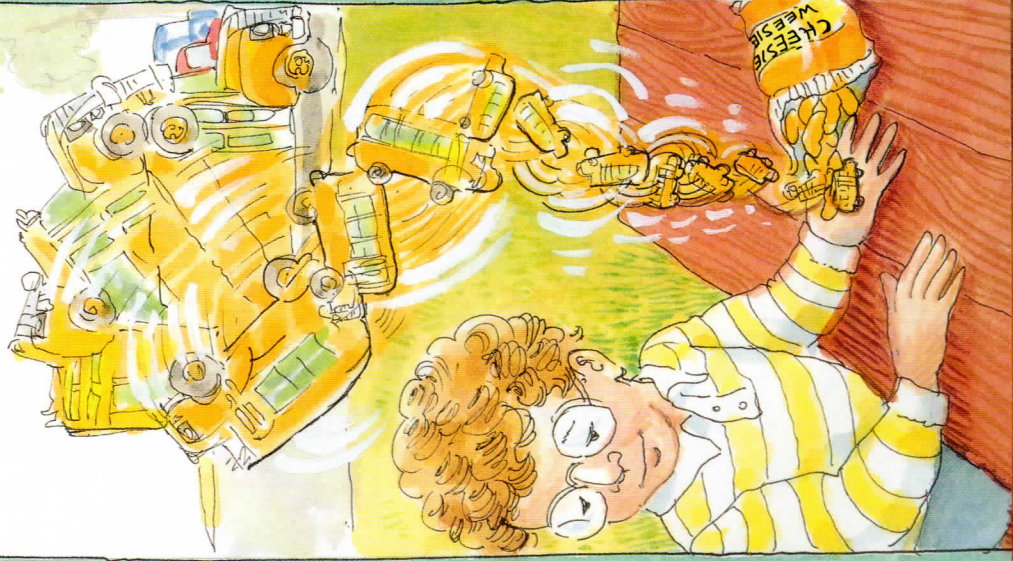


"Hurry up, Arnold!"  
called Ms Frizzle.  
She reached for the  
ignition key, but  
instead she pushed  
a strange little button  
nearby.

ARNOLD'S REALLY  
OUT TO LUNCH.

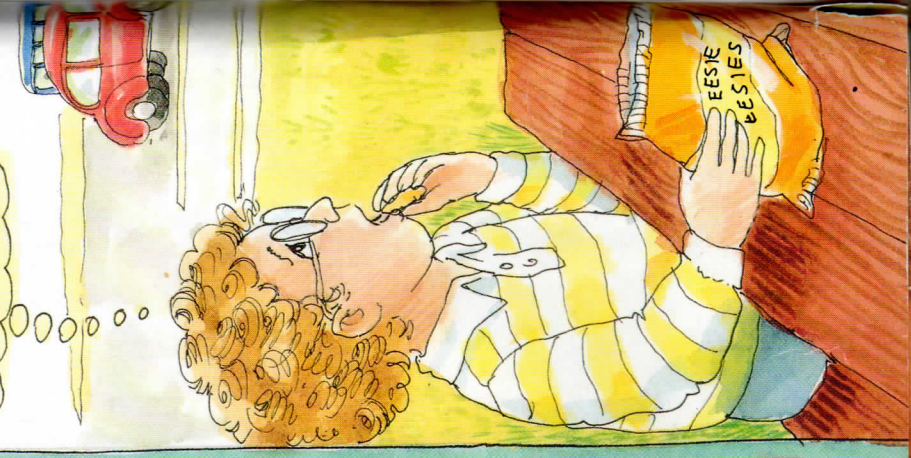


At once, we started  
shrinking and  
spinning through  
the air.



From inside,  
we couldn't see what  
was happening. All  
we knew was that  
we landed suddenly.

GULP!  
HEY, WHERE'S  
THE BUS?



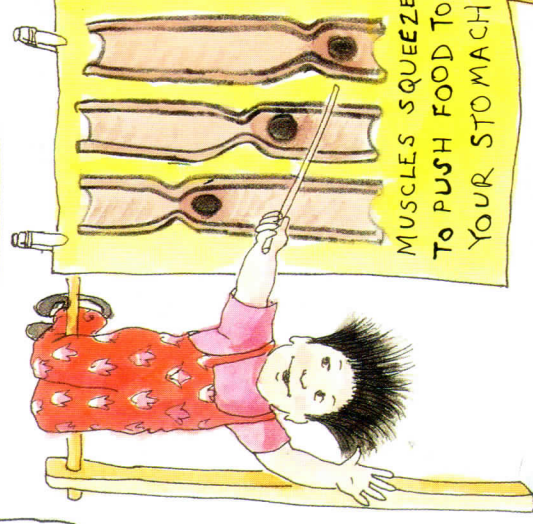
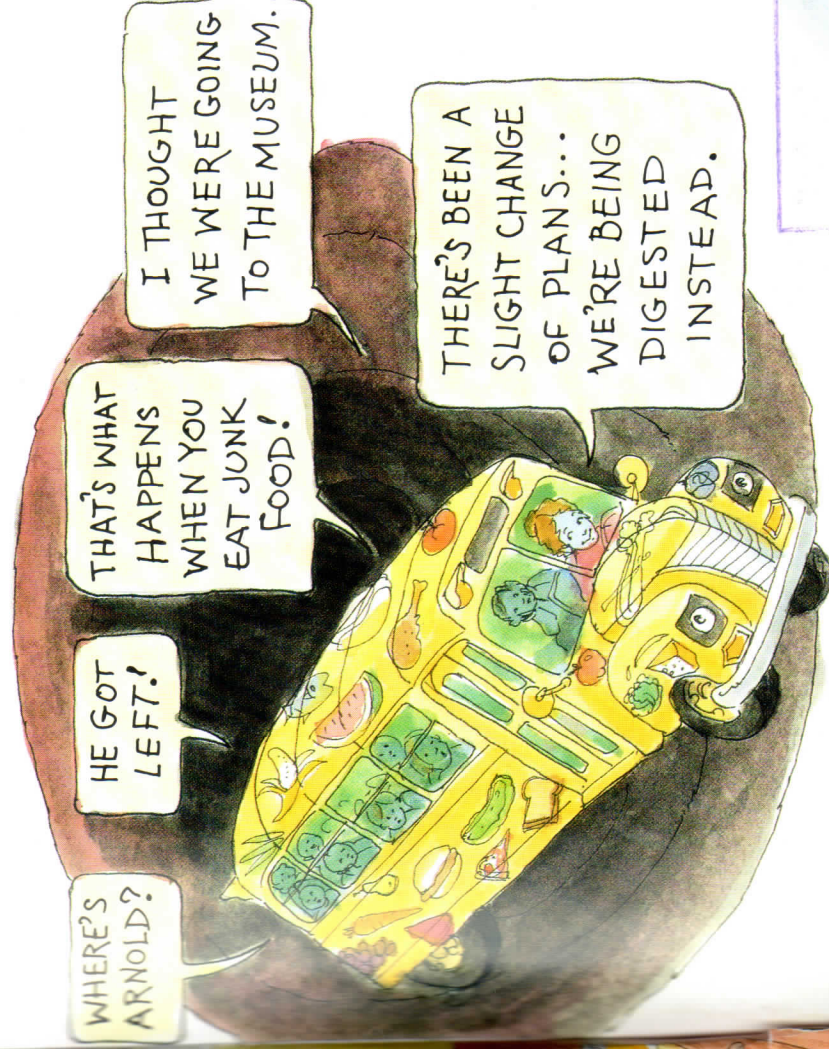


and then we were going down a dark tunnel. We had no idea where we were. But, as usual, Ms Frizzle knew. She said we were inside a human body, going down the oesophagus—the tube that leads from the throat to the stomach. Most of us were too upset about leaving Arnold behind to pay much attention.

## FOOD GOES TO YOUR STOMACH THROUGH THE OESOPHAGUS

by Wanda

The food does not just fall down. It is pushed along by muscle actions the way toothpaste is squeezed out of a tube. That's why you can swallow even when you are upside down.





# WHY DOES YOUR STOMACH GROWL?

by Phil

Sometimes your stomach churns when there is not much food in it. Then the gases in your stomach make a gurgling sound.

"We are now passing into the stomach," said Ms Frizzle.  
It wasn't exactly *quiet* in there. The walls of the stomach moved in and out, churning and mashing the food into a thick liquid.  
The bus was turning round and round, and digestive juice splashed the windows. Now we knew how it felt to be a hamburger!

YOUR STOMACH IS LIKE A BUILT-IN FOOD PROCESSOR.

GURGLE!

ROLL UP YOUR WINDOWS, CHILDREN.

YUCK!





Ms Frizzle drove to the bottom of the stomach.  
"We'll drive through this opening to the small intestine," she said.

IN THE SMALL INTESTINE,  
FOOD IS BROKEN DOWN  
INTO MOLECULES TINY  
ENOUGH FOR THE BODY  
CELLS TO USE.

I WANT TO  
GO HOME!

BUT THIS IS  
EDUCATIONAL.

DOES EDUCATION  
HAVE TO BE  
THIS MESSY?

I DON'T FEEL  
SO GOOD.  
MAYBE IT WAS  
SOMETHING  
I ATE.

POOR  
KID!





## WHY ARE THE INTESTINES COILED UP?

by John

In an adult the intestines are 7.5 metres (25 feet) long. If they were stretched out straight, a person would have to be as tall as a house.

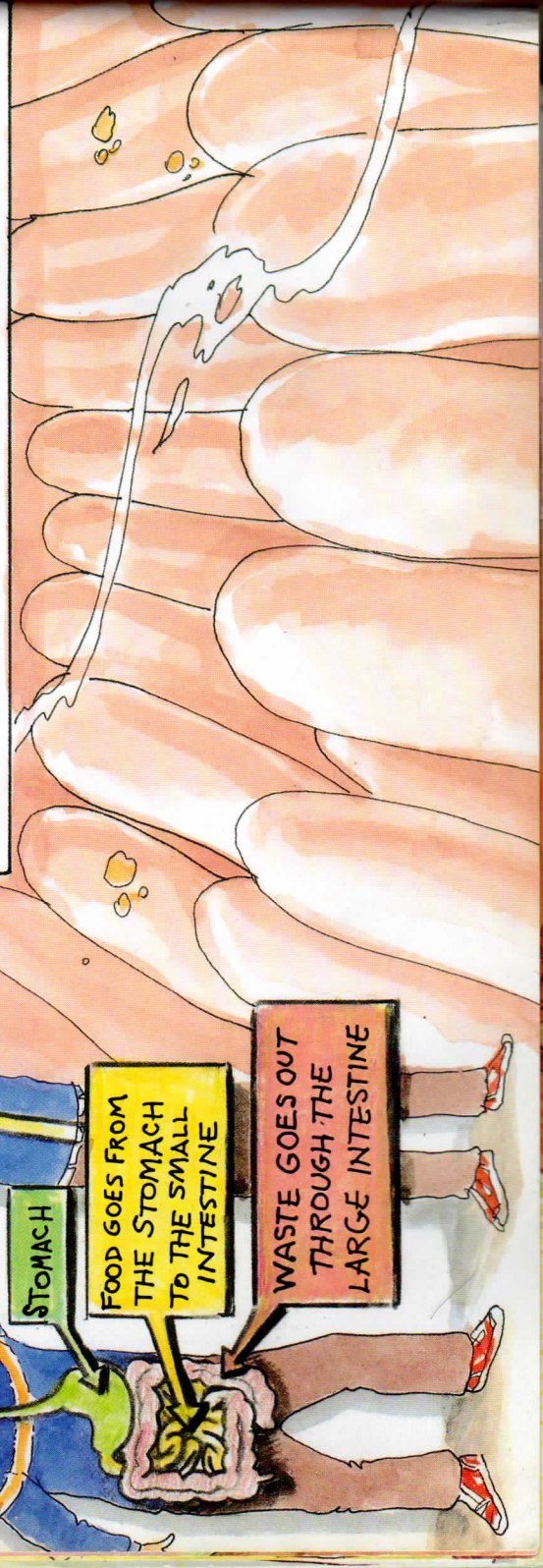


The small intestine was a coiled-up hollow tube. The inner walls of the tube were covered with tiny "fingers" called *villi*.

"In the *villi* are tiny blood vessels. Food molecules are taken into these blood vessels," said Ms Frizzle.

"Once the food is in the blood, it can travel all over the body."

We felt ourselves getting even smaller, and Ms Frizzle started driving into one of the *villi*. She was going straight into a blood vessel!





CLASS, THE BUS IS  
FOLLOWING THE PATH  
OF THE FOOD MOLECULES  
INTO THE BLOOD.

YOU MEAN THIS BODY  
THINKS WE'RE FOOD?

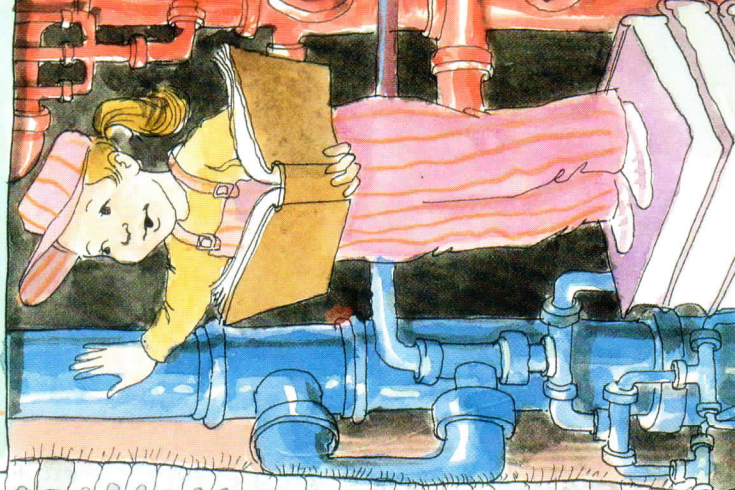
THAT'S BETTER  
THAN BEING WASTE.

I WISH ARNOLD  
WERE HERE  
TO SEE THIS.

YES, IT'S SO  
HORRIBLE!

• ANOTHER SCIENCE WORD  
by Dorothy Ann

Blood Vessels are  
tubes that carry  
blood. They are  
like pipelines  
running through  
your body.



essel!



## WHAT IS BLOOD MADE OF?

by Molly

A little more than half the blood is a yellowish fluid called PLASMA.

The rest of the blood is made of floating cells.

PLASMA

BLOOD CELLS

250,000,000

## WHY IS BLOOD RED?

Without a microscope, blood looks red because there are so many red blood cells in it!

In every drop of blood there are 250 million red blood cells.

Now we were in the blood, but it did not look red.

"Blood is not just a red liquid," explained Ms Frizzle.

"Blood is made of cells, floating in a clear fluid."

"Those cells look like red rubber saucers!" someone called out.

"Those are red blood cells," Ms Frizzle said.

"Red blood cells carry oxygen from the lungs to all the cells of the body."

DID YOU SEE THAT?

RED BLOOD CELLS CARRY OXYGEN

FOOD MOLECULES

WHITE BLOOD CELLS



Here and there a white blood cell  
was busy destroying disease germs.  
"White blood cells are like soldiers  
protecting your body from enemies,"  
said Ms Frizzle.

THE WHITE  
BLOOD CELL ATE  
THE GERM.

THAT'S  
DISGUSTING!

PLATELET CELLS  
(HELP STOP BLEEDING  
WHEN YOU GET A CUT)

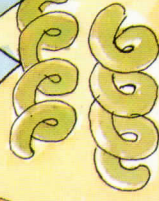
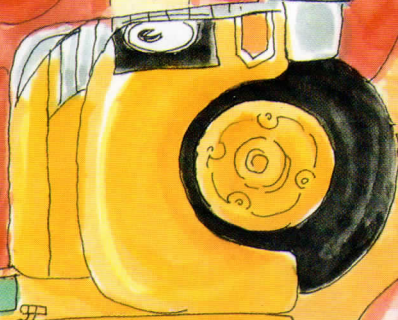
DISEASE GERMS

DESTROY DISEASE GERMS

WHAT IS BLOOD FOR?

by Ralph

Your blood is like  
a delivery service.  
It carries food and  
oxygen to your body,  
cells and waste products  
away from the cells.



4



Looking back, we saw a white blood cell chasing the bus.

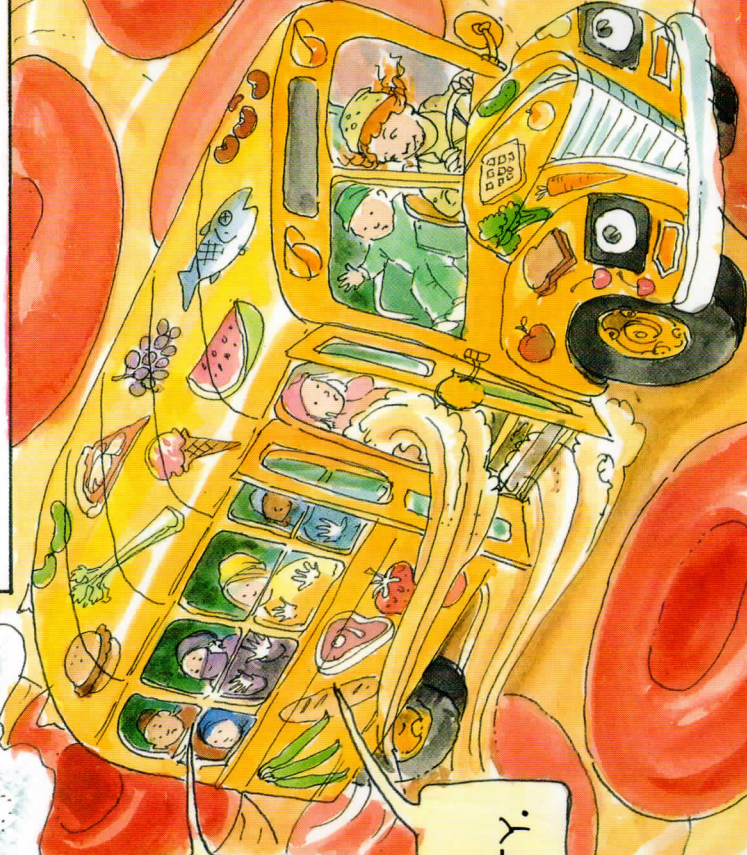
"We'll be safer with the red blood cells, kids," said Ms Frizzle.

She reached for the handle that controlled the bus's doors.

"Don't do it!" we cried,  
but when did Ms Frizzle ever listen?  
The doors of the bus flew open.

THAT WHITE BLOOD  
CELL MUST THINK  
THE SCHOOL BUS  
IS A GERM.

WELL, THE BUS  
IS PRETTY DIRTY.





We were swept out of the bus and into the bloodstream.

"Everybody hitch a ride!" called The Friz. Each kid grabbed a red blood cell as it went by.

Our last glimpse of the bus was when it went into another blood vessel—with the white blood cell right behind it!

WHY CAN'T WE  
JUST HAVE  
SPELLING TESTS  
LIKE OTHER KIDS?

WE'LL NEVER  
GET OUT OF  
HERE NOW!

THESE RED BLOOD CELLS  
HAVE TURNED DULL RED  
—THEY NEED  
MORE OXYGEN.

MEANWHILE...

OH MY GOSH!  
I'M LOST!

DON'T  
PANIC





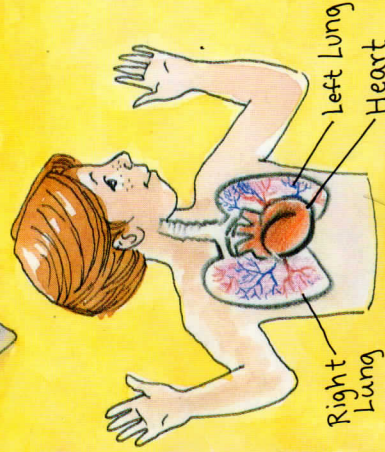
# YOUR HEART IS A PUMP

by Florrie

When the walls of the heart chambers squeeze together they pump out blood, just the way you can squeeze water out of a plastic squeeze bottle.

OOPS!

HEY!



YOUR HEART PUMPS USED BLOOD INTO THE LUNGS TO GET FRESH OXYGEN.

## RIGHT LUNG

The next thing we knew, we had flowed into the heart. "Inside the heart are four hollow spaces, called *chambers*," said Ms F. "Each chamber is a little pump." The two chambers on the right side of the heart took in used blood from the body and pumped it to the lungs.

TO THE RIGHT LUNG

USED BLOOD FROM UPPER BODY

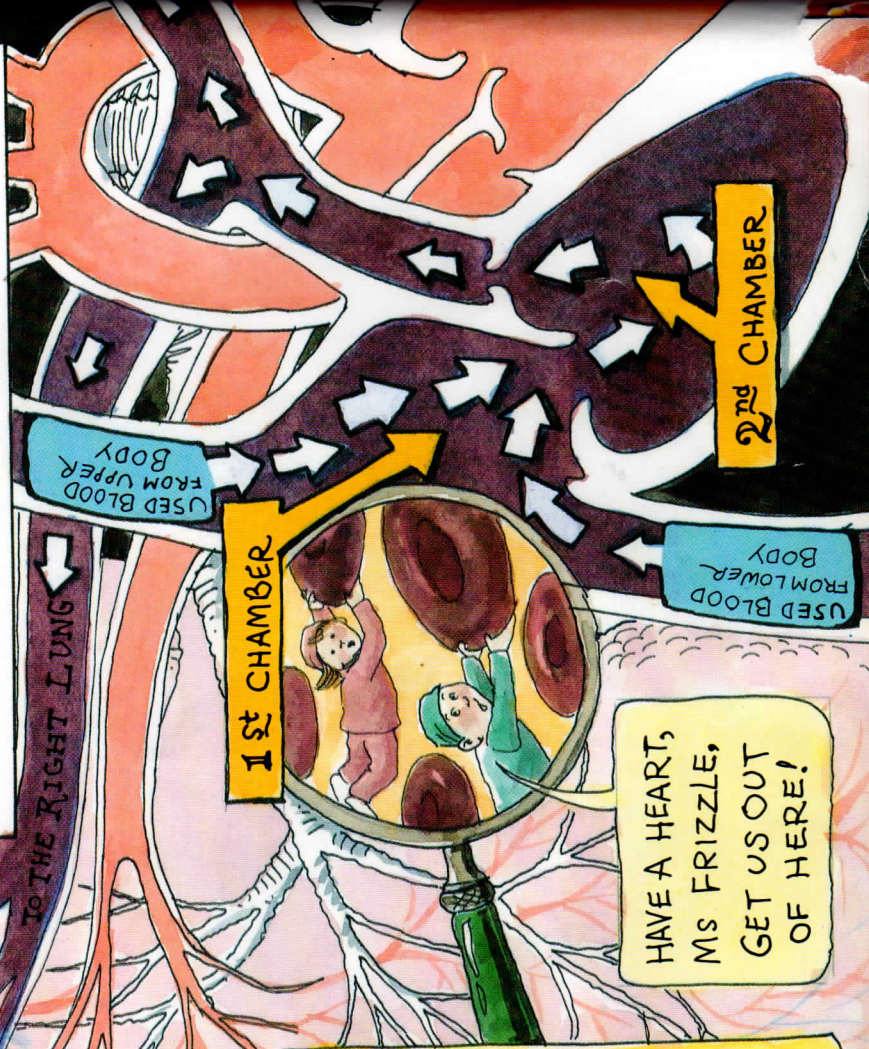
1<sup>ST</sup> CHAMBER



USED BLOOD FROM LOWER BODY

2<sup>ND</sup> CHAMBER

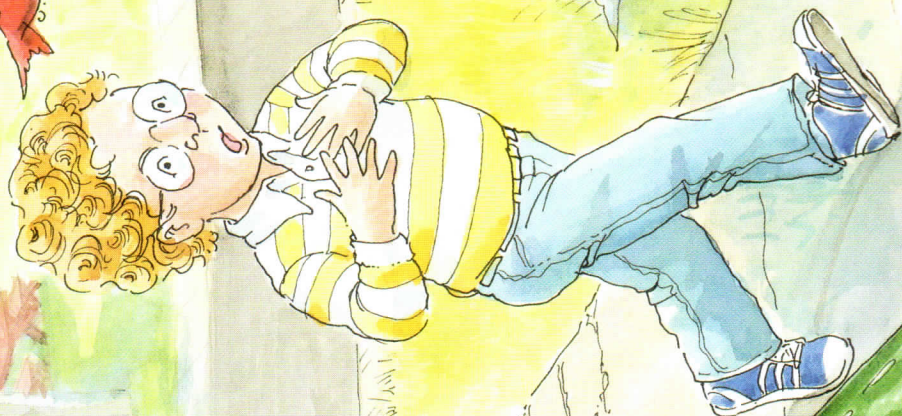
HAVE A HEART, MS FRIZZLE, GET US OUT OF HERE!





MY HEART IS  
POUNDING.

TAKE A DEEP  
BREATH.  
YOU'LL BE OK.



In the lungs, the red cells  
picked up fresh oxygen.

WE GET NEW OXYGEN  
FROM THE AIR EACH  
TIME WE BREATHE IN.

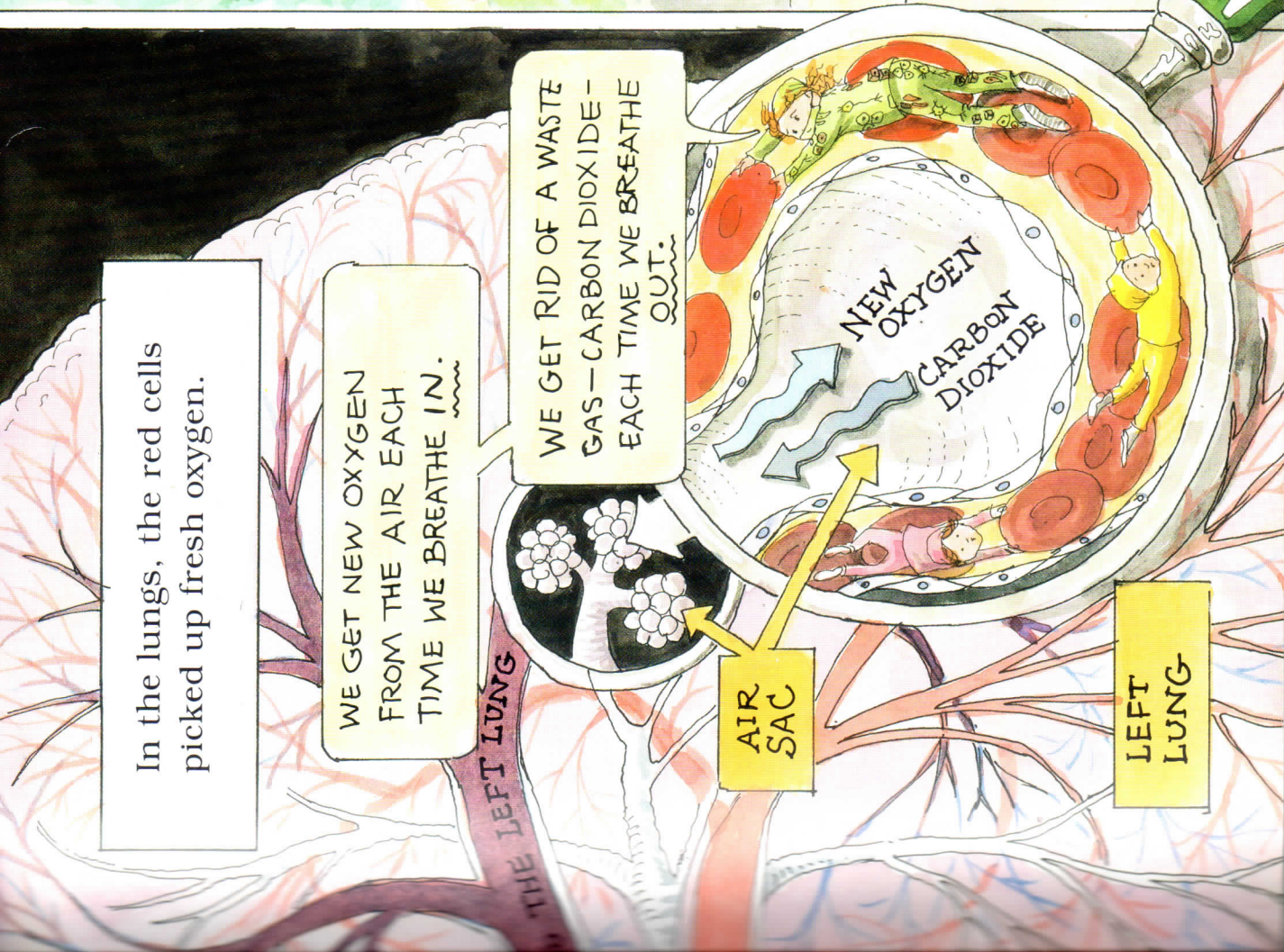
WE GET RID OF A WASTE  
GAS—CARBON DIOXIDE—  
EACH TIME WE BREATHE  
OUT.

AIR  
SAC

NEW  
OXYGEN  
CARBON  
DIOXIDE

LEFT  
LUNG

THE LEFT LUNG





## BLOOD GOES ROUND AND ROUND

by Michael

In less than a minute  
your blood makes  
a trip all around  
your body.

This is called the  
circulation of the  
blood.

## ONE MORE SCIENCE WORD

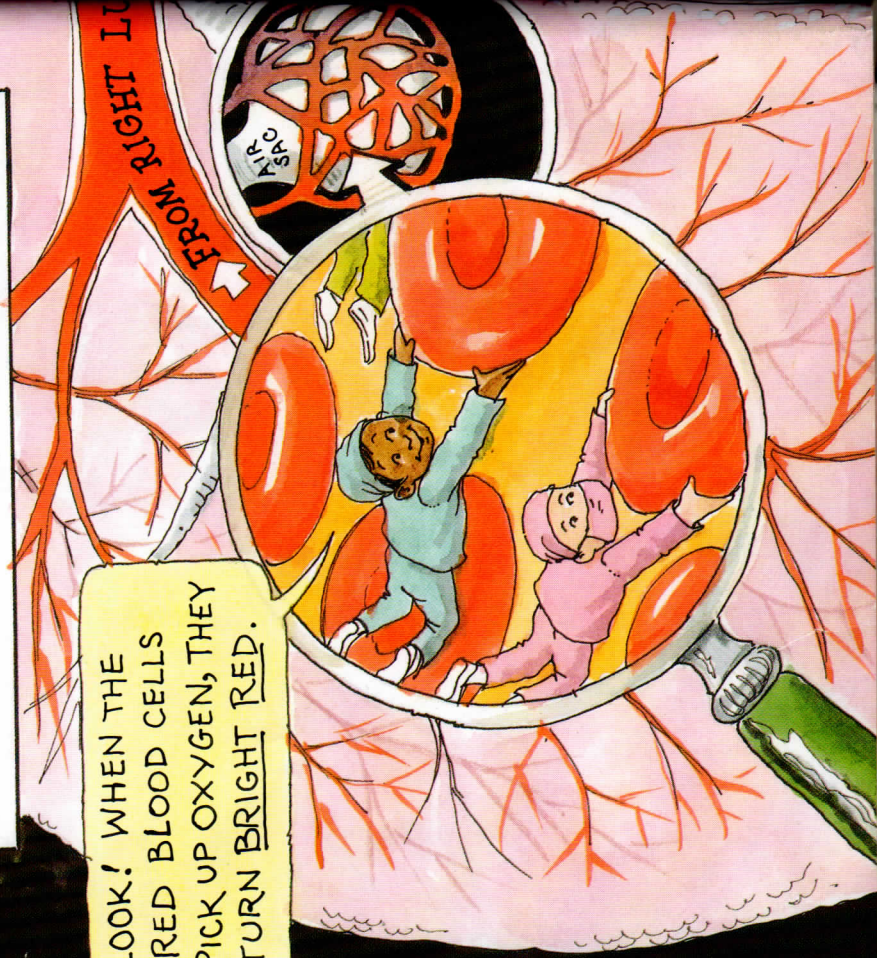
by Dorothy Ann

Circulate comes from  
a word that means  
"to circle." Blood  
circulates - circles -  
all around your body.

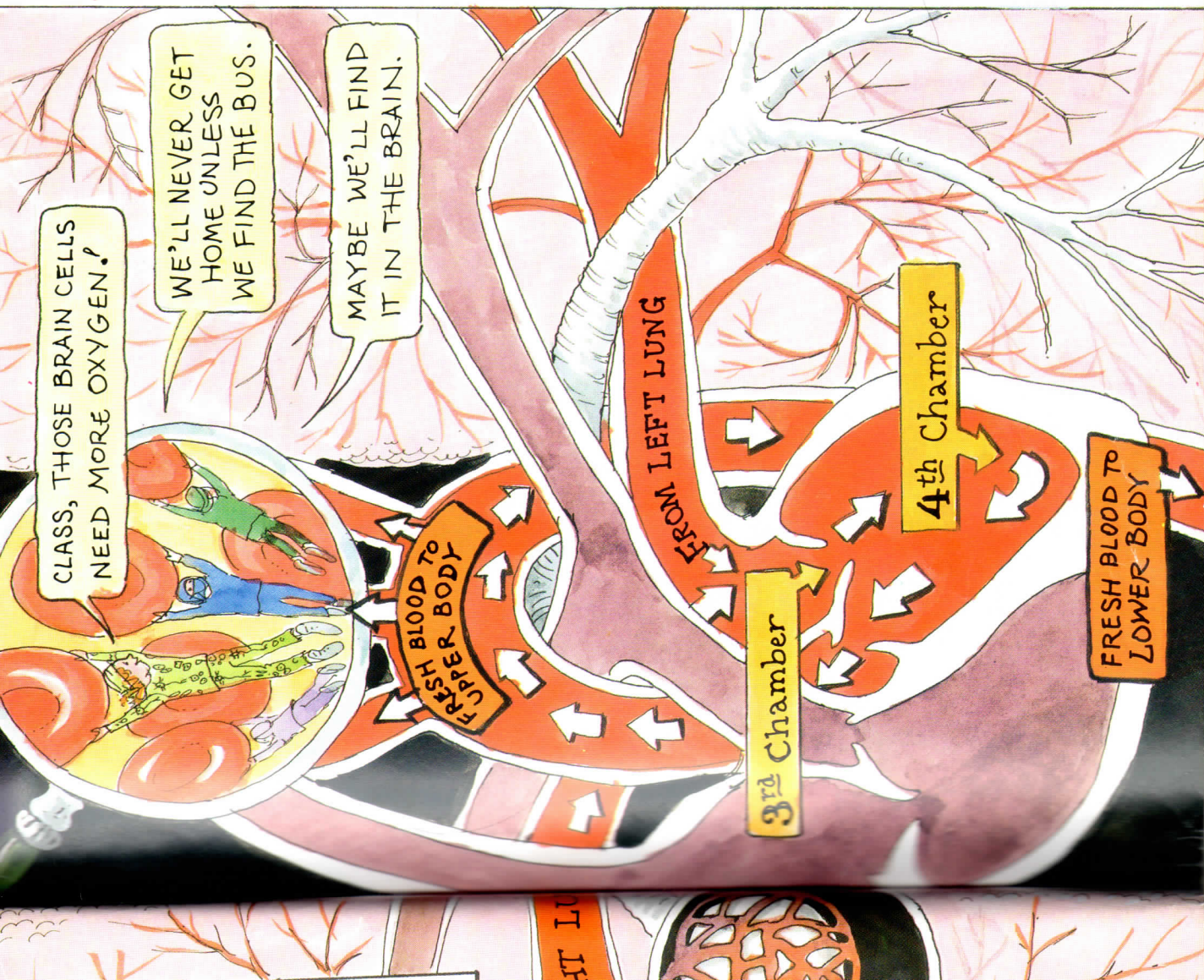


From the lungs, our red blood cells  
carried us back to the heart.  
This time we were on the left side  
of the heart—the side that pumps  
fresh blood back to the body again.  
“Kids, it looks as if these red  
blood cells are on their way to  
the brain,” said Ms Frizzle.

LOOK! WHEN THE  
RED BLOOD CELLS  
PICK UP OXYGEN, THEY  
TURN BRIGHT RED.









# • YOUR BRAIN IS ALWAYS WORKING

by Alex

Even when you're sleeping, your brain controls your heartbeat, breathing, and other body functions.

YOUR BRAIN NEVER LIES DOWN ON THE JOB.

3:00 A.M. and still at it.



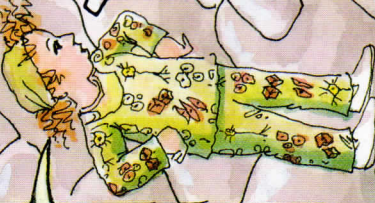
When we reached the brain, we let go of our red blood cells and squeezed out of the blood vessel. It was hard to believe that this wrinkled grey blob was the control centre of the body.

CHILDREN, WE ARE WALKING ON THE CEREBRAL CORTEX, THE PINKISH GREY, OUTER LAYER OF THE BRAIN. WITHOUT IT WE COULDN'T SEE, HEAR, SMELL, TOUCH, TASTE, TALK, MOVE, OR THINK!

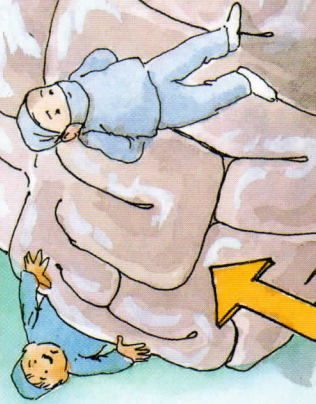
CEREBRAL CORTEX  
Controls thinking, moving and the five Senses.

SPEECH CENTRE

HEARING CENTRE



MOTOR CENTRE (TELLS MUSCLES TO)





Ms Frizzle said

the brain is made of  
billions of busy nerve cells.  
They are constantly sending  
and receiving messages  
from the eyes, ears, muscles,  
and other parts of the body.

LET'S SEE...

MS FRIZZLE WAS  
DRIVING THAT WAY  
TO THE MUSEUM,  
SO OUR SCHOOL  
MUST BE THIS WAY.

GOOD THINKING

WHERE'S  
THE BUS?

DO YOU THINK  
WE'LL BE SMARTER  
AFTER THIS?

I HOPE  
SO!

### CEREBELLUM:

Helps you keep your  
balance, Helps muscles  
work together.

### BRAIN STEM:

Controls body functions  
like heartbeat and  
breathing.

VISION  
CENTRE

VISION  
CENTRE

VISION  
CENTRE

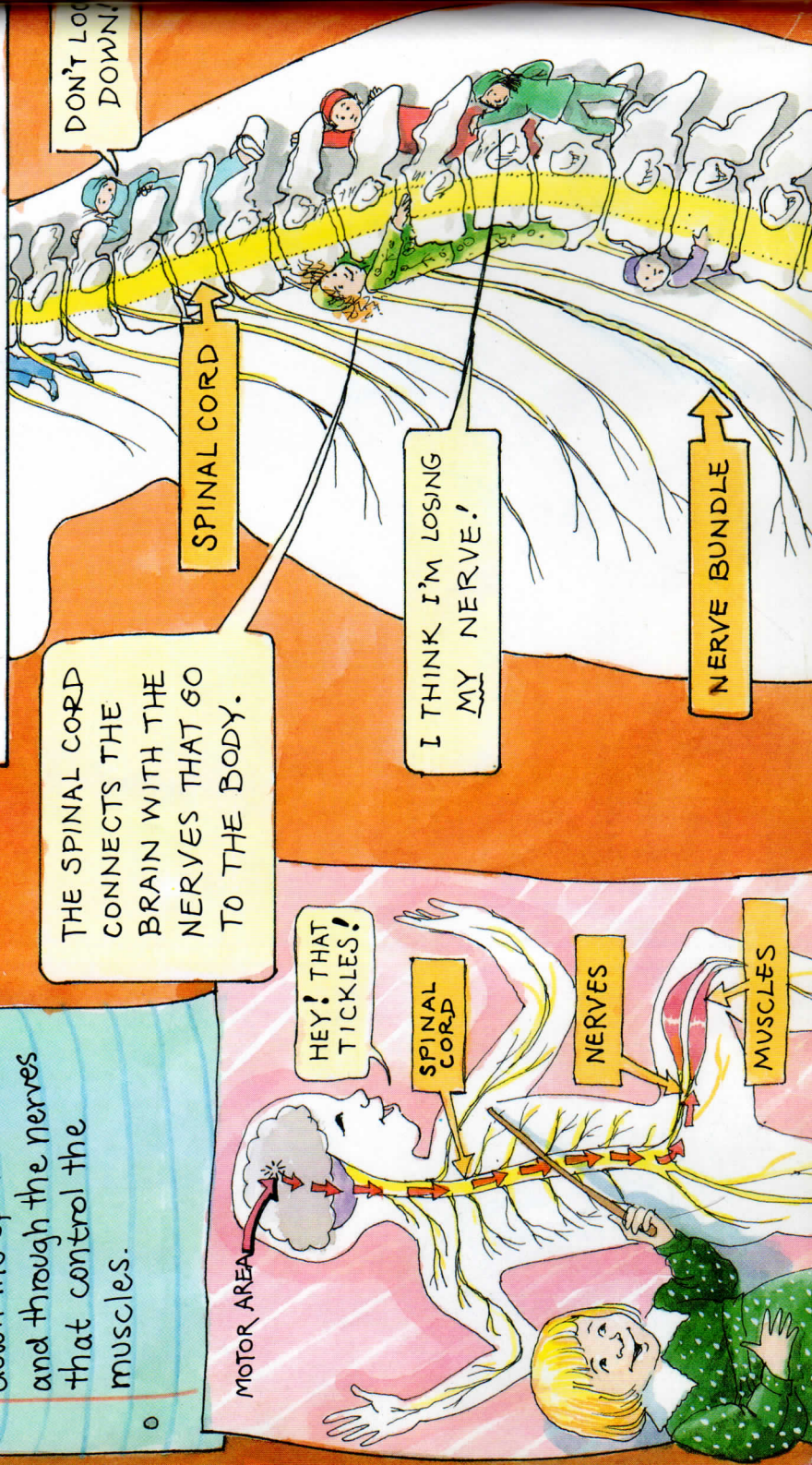


# IF YOU WANT TO MOVE A MUSCLE

by Amanda Jane

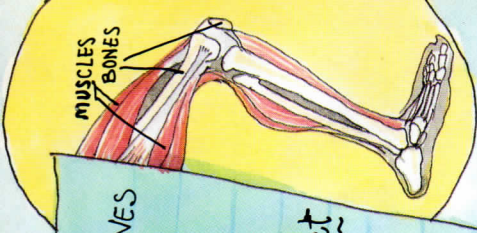
The motor area  
(in the cortex) of your  
brain sends out a  
message to move.  
The message travels  
down the spinal cord  
and through the nerves  
that control the  
muscles.

We left the head by climbing down  
the bones of the spine.  
Inside the bones was the spinal cord—  
a thick bundle of nerve cells  
stretching from the brain.  
Smaller bundles of nerve cells branched  
out from each side of the spinal cord.  
These carried nerve messages  
to all the parts of the body.





We followed some nerves that went to the leg muscles. The leg muscles were working hard. They needed a lot of energy. They used up a lot of food and oxygen from the blood. The heart was beating faster to carry fresh blood to the muscle cells.



MUSCLES MOVE YOUR BONES by Tim

Some muscles are attached to bones. When the muscles contract (get shorter) they pull on the bones. That makes the bones move, and then you move.

CHILDREN, WE ARE SLIDING ON A MUSCLE. FROM HERE, WE'LL RETURN TO THE BLOODSTREAM.

NERVE ENDING

MUSCLE FIBRE

BLOOD VESSEL

I'LL GET THERE SOONER IF I RUN! (PANT! PANT!)

I WONDER WHERE ARNOLD IS NOW.

I HAVE THE STRANGEST FEELING HE'S CLOSE BY.

THE MORE ACTIVE YOU ARE THE FASTER YOUR HEART BEATS.



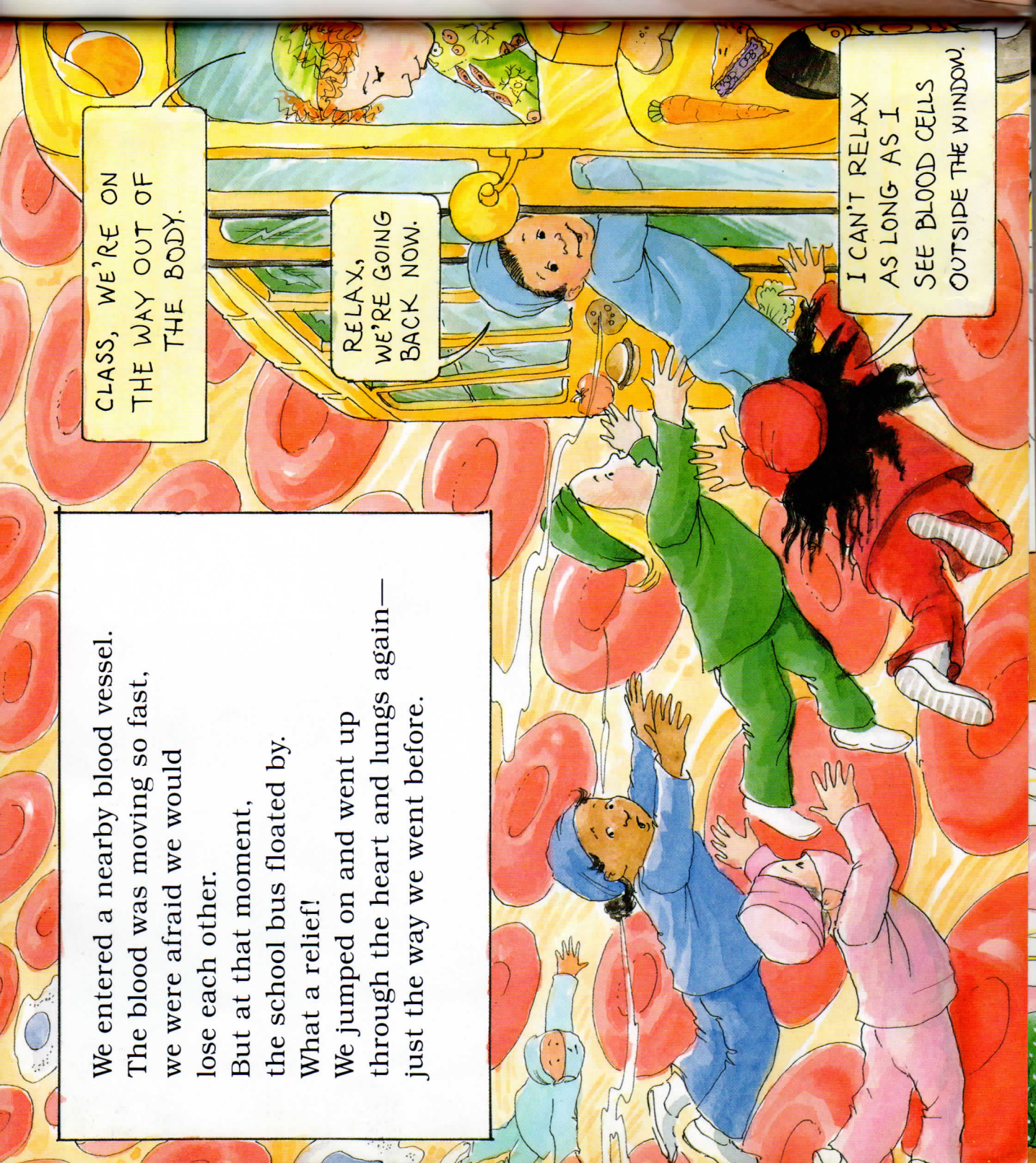


We entered a nearby blood vessel.  
The blood was moving so fast,  
we were afraid we would  
lose each other.  
But at that moment,  
the school bus floated by.  
What a relief!  
We jumped on and went up  
through the heart and lungs again—  
just the way we went before.

CLASS, WE'RE ON  
THE WAY OUT OF  
THE BODY.

RELAX,  
WE'RE GOING  
BACK NOW.

I CAN'T RELAX  
AS LONG AS I  
SEE BLOOD CELLS  
OUTSIDE THE WINDOW.





When we emerged from the bloodstream, we were in a huge open space. "Where are we?" asked a kid.

Ms Frizzle explained,

"Children, this is the nasal cavity."

"The what?" we asked.

"The inside of the nose," said The Friz.

Suddenly, we heard a deafening noise. It sounded like "Ah-aa-ah-ah!"

WE'RE IN  
A NOSE?

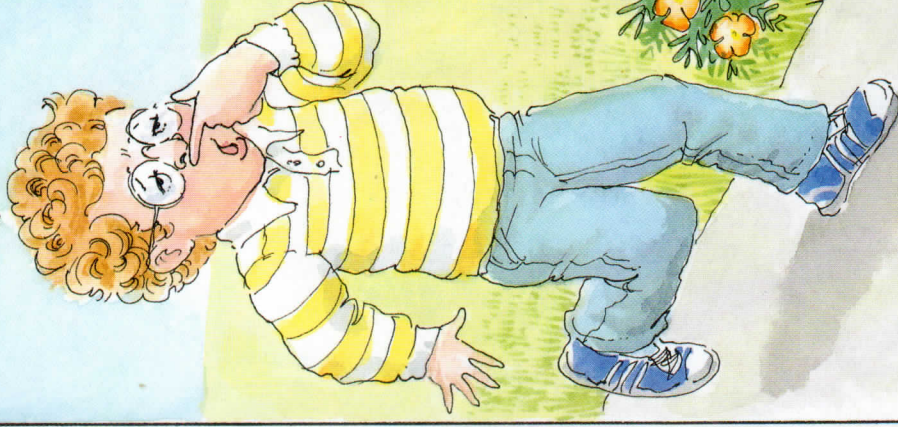
THIS TIME  
SHE'S GONE  
TOO FAR.

THIS IS  
TOO MUCH!



USE YOUR  
HANKIE.

I THINK I'M  
GOING TO  
SNEEZE...





## WHAT MAKES YOU SNEEZE?

by Phoebe

If something is tickling the inside of your nose, the tickling signals your brain.

- The brain makes you take an extra big breath. (That's when you say

Aaahh!)

- Then your brain makes your chest muscles squeeze your lungs.

Air rushes out at speeds of up to 100 miles per hour. (That's when you say choo!)



Then we heard,  
"CHOOOOOO!"

CLASS, THE SOUND  
YOU HEAR IS A SNEEZE.

ANYTHING IN THE NOSE  
CAN MAKE YOU SNEEZE.  
IT COULD BE A BIT  
OF DIRT OR DUST,  
OR SOME BACTERIA.

IN THIS CASE  
IT HAPPENS  
TO BE A  
SCHOOL BUS.





A tremendous blast of air  
hit the bus full force.  
We flew forward,  
spinning round and round.

CHILDREN, PREPARE  
FOR LANDING.  
PLEASE REMAIN SEATED  
UNTIL THE SCHOOL BUS  
HAS COME TO A  
COMPLETE STOP.

IS SHE FOR REAL?

A-A-A-AH

CHOO!

BLESS YOU!





We were going so fast,  
we couldn't see anything,  
but we could tell we were getting bigger.  
Then—thud!—we landed.  
There we were, back at school.  
And there was Arnold,  
in the school car park,  
blowing his nose.

WE'RE BACK!





"Arnold!" we said, "the trip was *amazing*!  
You should have been there!"

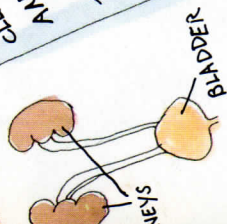
WHERE WERE YOU?



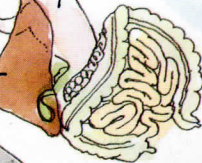


Back in the classroom,  
it was business as usual.  
Ms Frizzle made us draw  
a chart of the human body  
for the bulletin board.

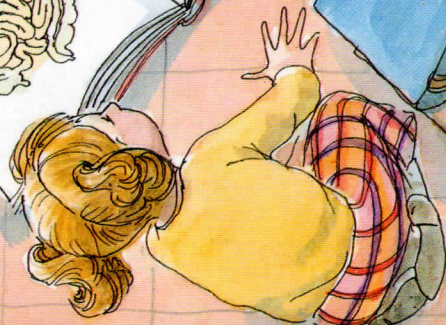
THE KIDNEY'S  
CLEAN YOUR BLOOD  
THE BLADDER  
STORES URINE.  
AND MAKE URINE.



LIVER  
STOMACH



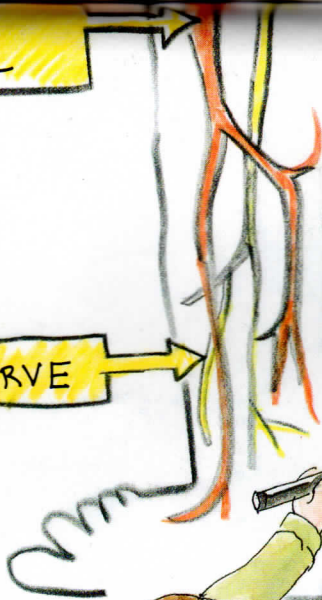
THE LIVER STORES  
VITAMINS AND  
DESTROYS POISONS.  
IT ALSO MAKES BILE,  
A FLUID THAT HELPS  
DIGEST FATTY FOODS.



NERVE



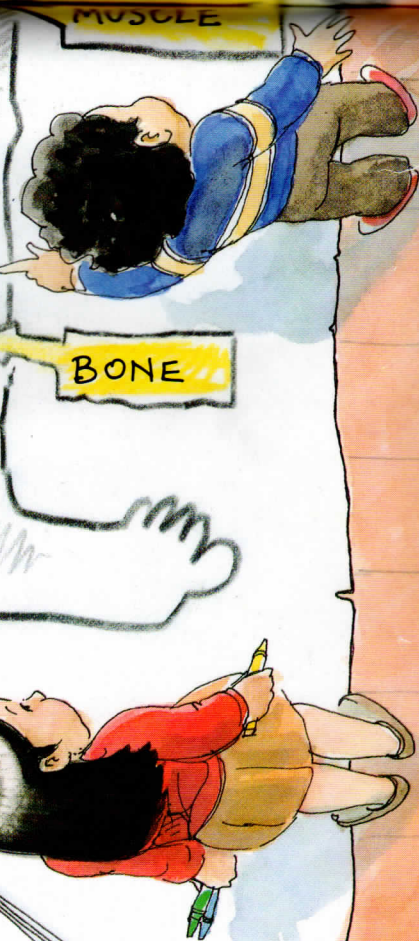
BLOOD  
VESSEL



BONE



MUSCLE



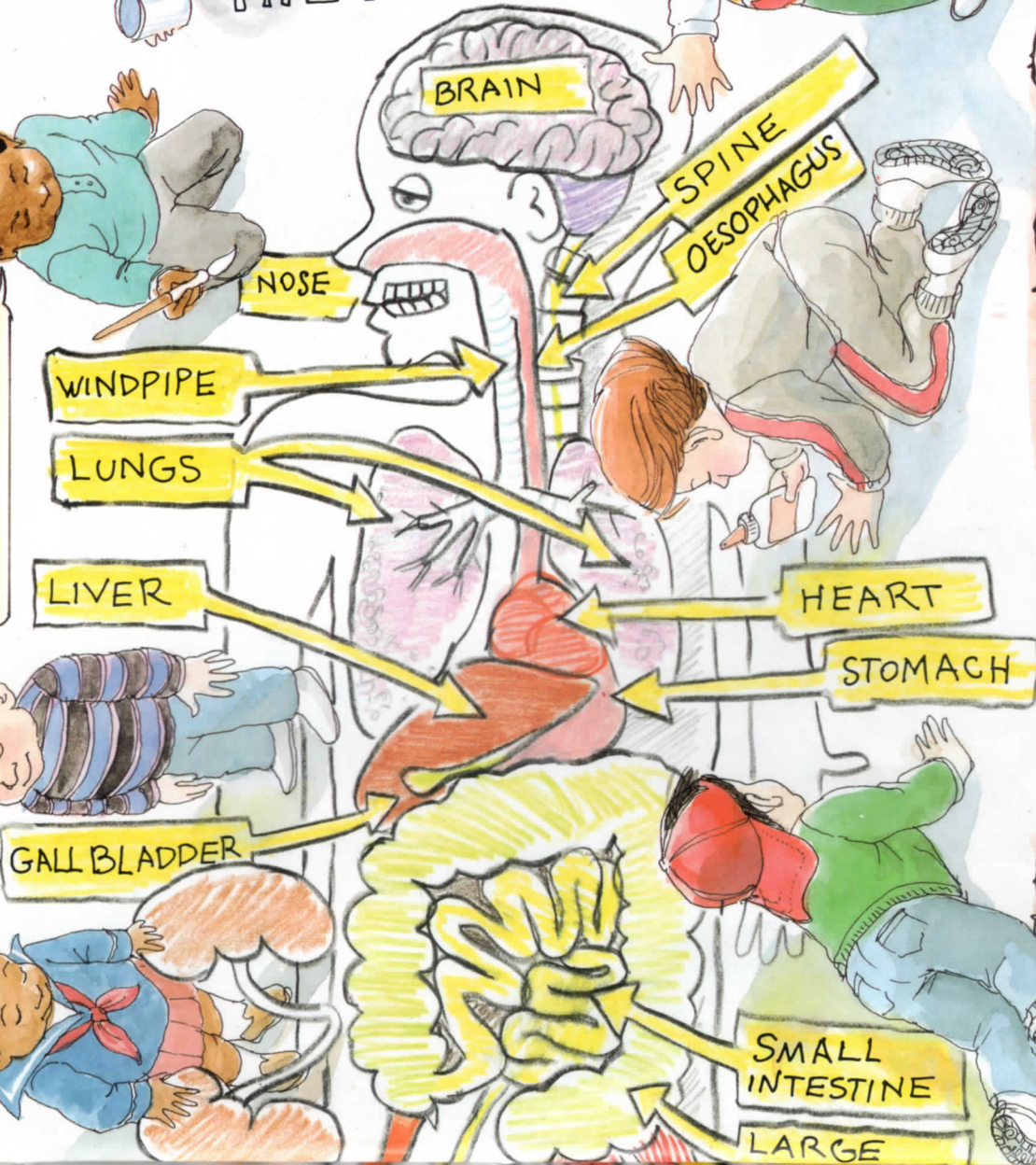


CAN WE SLIP THESE KIDNEYS  
IN BEHIND THE INTESTINES?

KIDNEYS? LIVER?  
WE DIDN'T  
HAVE TIME TO  
GO THERE.

THANK GOODNESS.

# THE HUMAN BO



SMALL  
INTESTINE

LARGE

STOMACH

HEART

LIVER

LUNGS

WINDPIPE

NOSE

BRAIN

SPINE  
OESOPHAGUS

GALL BLADDER

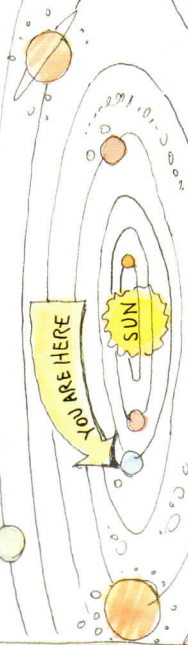






At last, everything was quiet  
in Ms Frizzle's class—  
everything, of course,  
except her dress!

## OUR SOLAR SYSTEM



SHE MUST BUY  
HER CLOTHES  
IN OUTER SPACE.

DON'T GIVE HER ANY IDEAS!

RED BLOOD  
CELLS  
ARE CUTE!



by molly

My favourite Organ  
by Carmen

THE NOSE  
It's a Front-  
runner

My favourite Organ  
by Arnold  
A FULL STOMACH.

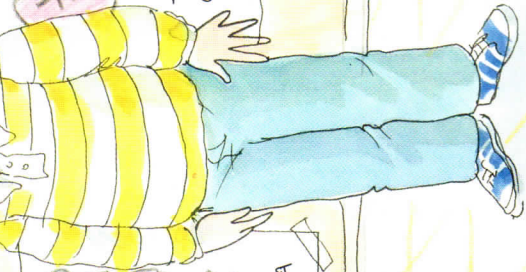
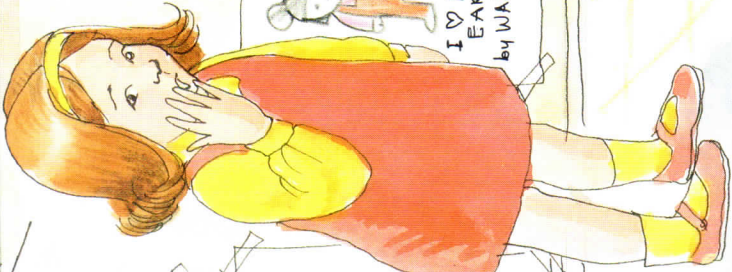
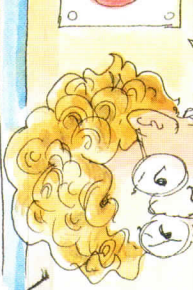


THE HAIR

MY LUNG

KEEP  
THEM  
CLEAN  
by Tim

I LOVE MY  
EARS  
by Wanda





## TRUE-OR-FALSE TEST

### HOW TO:

Read the sentences below. Decide if each one is true or false. To see if you are correct, check the answers on the opposite page.

### QUESTIONS:

1. A school bus can enter someone's body and kids can go on a tour. True or false? ~~F~~
2. Museums are boring. True or false? ~~F~~
3. Arnold should not have tried to get back to school by himself. True or false? ~~T~~
4. Children cannot breathe or talk when they are surrounded by a liquid. True or false? ~~T~~
5. If the children really were as small as cells, we couldn't see them without a microscope. True or false? ~~T~~
6. White blood cells actually chase and destroy disease germs. True or false? ~~T~~
7. Ms Frizzle really knew where Arnold was the whole time. True or false? ~~T~~

STOP! TAKE THIS TEST!  
DO NOT WATCH TV... YET.  
DO NOT GET A SNACK... YET.  
DO NOT PLAY A VIDEO  
GAME... YET.  
FIRST TAKE THIS TEST.





### ANSWERS:

1. False! That could not happen in real life. (Not even to Arnold.)

But in this story the author had to make it happen. Otherwise, the book would have been about a trip to a museum, instead of a trip through the body.

2. False! Museums are interesting and fun. But they are not as strange and gross as actually going inside a human body.

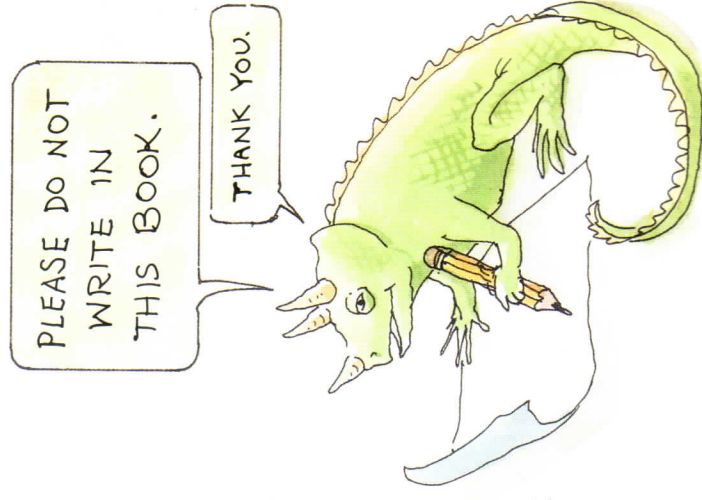
3. True! In real life, it would have been safer if Arnold had found a police officer to help.

4. True. If children were *really* inside a blood vessel, they would drown. It must have been magic.

5. True! The pictures in this book show the cells and the children greatly enlarged.

6. True! As unbelievable as it seems, real white blood cells actually behave just like the ones in this book. They even squeeze through the cells of blood vessel walls to capture germs in your organs and tissues.

7. Probably true. No one is absolutely sure, but most people think Ms Frizzle knows *everything*.













# THE MAGIC BUS

## INSIDE N87

### HUMAN BODY

Ms Frizzle is taking her class to see an educational exhibition on how the body turns food into energy. But with Ms Frizzle at the wheel of the bus it turns out to be no ordinary school outing. Somehow the bus shrinks. Then it is swallowed, and Ms Frizzle's class starts to learn about digestion from the inside of a real human being!

The Magic Bus is a new series of informative action-packed science books for young readers.

Titles include:

AT THE WATERWORKS  
INSIDE THE HUMAN BODY  
LOST IN THE SOLAR SYSTEM  
INSIDE THE EARTH

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